REMARKS

Claims 2 - 15, 25, 26, 31, 38 - 44, 46 and 47 remain active in this application. Claims 1, 16 - 24, 27 - 30, 32 - 37 and 45 have previously been canceled. No amendments are currently presented and no new matter has been introduced into the application. The withdrawal of previous grounds of rejection and requirement for election of species is noted with appreciation.

Claims 2 - 7 10, 12 - 14, 31, 38 - 44, 46 and 47 have been rejected under 35 U.S.C. §103 as being unpatentable over Baker in view of the Murphy et al. publication and Funkhouser et al. (newly cited). Claims 8, 9, 11, 15, 25 and 26 have been rejected under 35 U.S.C. §103 as being unpatentable over Baker in view of the Murphy et al. publication, Funkhouser et al. and Cox et al. Both of these grounds of rejection are respectfully traversed.

The invention is directed to a cutting die and a process for making such a cutting die which exploits the discovery by the inventors that if a material suitable for forming a blade is applied to a puddle of melted material of a die base upon formation of the puddle while continuing the movement of a laser along a path to melt further material of the die base, a deposit of blade material can be formed having a shape very close to the final desired shape of the blade so that machining of the deposit is minimal and, further, the resulting cutting die will be of unexpected durability, possibly due to the limitation of mixing of the blade material with the material of the die base by limiting the melting of the blade material by direct impingement of the laser beam on the powdered blade material and the melting of the blade material in and at a surface of the puddle, as claimed,

to limit mixing of the blade and die base materials. These unexpected properties of the cutting die have been verified by letters of accolade from Gregg Harrison and Graham Bell, who are representatives of customers, which are referenced in a declaration under 37 C.F.R. §1.132 of Paul S. Madill as evidence of commercial success submitted with the response filed July 5, 2001 (by Certificate of Mailing).

As previously pointed out in the response filed October 13, 2009, Baker is an early and basic disclosure of forming a cutting die by forming a weld bead on a die body and machining only the weld bead to the final blade shape rather than the prior technique of machining the blade from a die blank formed from blade material. Since less machining is required for machining only the weld bead and the process is more economical, Baker discloses that it allows the economically feasible use of blade materials which are harder and more abrasion resistant than previously practical and suggests tungsten carbide as an example of a suitable blade material. The Examiner admits that Baker does not teach or suggest the claimed powdered form of the blade material or use of a laser as a heat source and relies on Murphy et al. and Funkhouser et al. for such teachings.

However, Baker discusses virtually no details of the manner by which the weld bead is formed other than that it is done by welding, either manually or by an automatic, tape-controlled machine (see column 3, lines 24 - 38). Baker does not teach or suggest the *combination* of forming a puddle of the die body material, particularly through use of a laser, and applying powdered blade material to the puddle upon formation of the puddle such that the blade material is melted in and at the surface of the puddle to form a *deposit of blade*

material extending from the surface of the die body. The exemplary bead illustrated by Baker is relatively wide and flat which Baker evidently considers advantageous to provide "an adequate base from which the cutting edge can be formed" (column 3, lines 39 - 49) and to provide adhesion of the bead to the die body and reinforce the blade (see column 4, lines 6 - 7). Thus, as seen from Figures 3 - 8 of Baker, a substantial portion of the weld bead must be machined away to form the cutting edge of the blade to a desired shape in a lengthy series of machining operations. In other words, the weld bead itself does not approximate the final desired shape of the blade as is achieved by the invention and referred to as "near net shape" and requires substantial machining and removal of a significant portion of the weld bead of hard material to obtain the desired shape.

Murphy et al. was first cited and applied against the claims in the office action mailed August 25, 1999, and was evidently overcome by the response filed July 5, 2001, which included a declaration of Dr. C. Rey Hsu. (Murphy et al. does not appear to have been cited in an IDS of August 25, 1999, as indicated by the Examiner since the file of the undersigned does not include an IDS of that date and the Murphy et al. publication is cited on a form PTO-892 attached to an office action of that date which applies Murphy et al. against the claims.) That response (which is hereby fully incorporated by reference) included arguments that Murphy et al. contains a survey of techniques for rapid prototyping and summarizes experiments regarding the feasibility of rapid prototyping by cladding and that Murphy et al. contains no teaching or suggestion of substituting cladding for welding (particularly as a solution for problems such as causing stress or cracking which often result from

welding processes), that cladding could be performed with materials suitable for a blade which are highly dissimilar to the surface upon which cladding is performed or that a near net shape closely approximating the final desired shape for a cutting die blade could be produced by cladding. Further, the remarks of that response pointed out that the prototyping of Murphy et al. was principally directed to only the cladding of a material on a surface of a like material and was for the purpose of forming *non-functional* parts to facilitate visualization of three-dimensional parts that would be difficult to visualize from drawings. The remarks also pointed out that there was no motivation for combination with a reference (Tanaka) which, like Baker, developed a cutting die by forming and later machining (and hardening in Tanaka) a weld bead and that the asserted modification by substitution of processes without any teaching or suggestion of developing a cladding bead substantially similar to the desired shape for a blade amounted to an attempted hindsight reconstruction of the invention that still failed to answer the claims. These remarks were fully supported by the declaration of Dr. Hsu which additionally observed that the invention is directed to forming a blade following two-dimensional patterns rather than developing three-dimensional prototype part shapes, that the rapid prototyping process of Murphy et al. is not capable of using materials suitable for a cutting die blade and that the materials reported to be used by Murphy et al. are not only limited to cladding of a material onto a surface of the same material (e.g. cobalt on cobalt and 314 stainless steel on 314 stainless steel) but do not exhibit suitable wear resistance for a cutting die.

In this regard, it is respectfully pointed out that while Murphy et al. mentions that "almost any metallic powder can be used as a cladding material", Murphy et al. is effectively limited to cladding of like materials to eliminate a major source of residual stress and potential deformation or distortion or other defects in the shape that is prototyped in the manner disclosed (see section 3.7). Further, the methodology of Murphy et al. does not answer the claimed subject matter since the focal spot of the laser and the focus of the powder feed "are *aligned* on the top surface of the layer" being clad (see section 3.2 and also section 3.5 again referring to "alignment" of the laser spot and the powder). Therefore, a significant portion of the melting of the cladding powder is evidently due to direct impingement by the laser beam. Moreover, while Murphy et al. indicated that the shape of the cladding bead can be varied by variation of cladding conditions (see section 2.2 and Figure 3), Murphy et al. does not report development of a bead shape that corresponds to a near net shape for a cutting die blade or any recognition that such a bead shape having such a utility and substantially minimizing machining could, in fact, be formed, much less by cladding of a blade material onto a dissimilar material using the process claimed of applying powder to a puddle of molten die base/body material while scanning the laser along a path to melt further die body material and thus melting the blade material in and at the surface of the puddle, as admitted by the Examiner. It is also respectfully submitted that the combination of the general cladding techniques for building up an arbitrary three-dimensional shape disclosed by Murphy et al. with a reference developing a blade by substantial machining of a weld bead (as in Baker) does not provide any expectation of

success in forming a *functional* cutting die blade by cladding or that a bead having a shape approximating a desired blade shape that would support a conclusion of obviousness.

Further, the Examiner admits that the combination of Baker and Murphy et al. does not teach or suggest the puddle being larger than the area of laser beam impingement and cites Funkhouser et al. for illustrating a puddle larger than the area of laser beam impingement in (prior art) Figure 3. However, it is respectfully pointed out that this illustration and the passages of text relied upon by the Examiner do not answer the recitations (emphasis added) of

> "heating an area of said die body by scanning an area with a laser to form a puddle of melted die body material *in said area in the surface of said die body along a path corresponding to said pattern*, said area being greater than an area of said die body on which said laser directly impinges" (claim 38, similar recitations in claims 13 and 44).

Thus, the entirety of the recitation requires that the area of the puddle being made greater than the area of impingement of the laser beam by scanning *and* that it be along the path of the blade pattern; neither of which is taught or suggested by the general discussion of prior art cladding processes in Funkhouser et al.

In this regard, as pointed out above, Murphy et al. explicitly states that the focal *spot* of the laser beam and the focus of the powder application are coincident at the surface being clad and that the direction of the powder feed relative to the laser beam path is substantially critical (see section 3.4), thus effectively teaching away from applying the powder to the

puddle for melting in and at the surface of the puddle. It is also respectfully pointed out that substantially the same recitation in regard to the laser beam and powder application location appears in column 6, lines 17 - 20, of Funkhouser et al. Specifically, Funkhouser states (emphasis added) that "the laser beam and the powder exit the laser spray nozzle essentially coaxially, *and have the same focal point*", indicating that the powder application and area of laser impingement are substantially coincident if not congruent. Further, under such conditions, substantial melting of the powder would be due to the direct impingement of the laser beam on the powder, possibly causing the dispersion of the powder in the melt pool observed at column 5, line 69 through column 6, line 2, which is indicated to alter the composition of the surface layer, contrary to the effects of the invention where the powder is melted in and at the surface of the puddle while the laser progresses along the blade path, as claimed. Therefore, the combination of Baker, Murphy et al. and Funkhouser et al. does not address the claim recitation quoted above or the claim recitation (emphasis added) of:

> "applying a blade material in the form of a powder to said puddle *while continuing said step of heating said die body corresponding to said path such that said powder is melted in said puddle and at a surface thereof* to form a deposit comprising said blade material extending from said surface" (claim 38, similar recitations appearing in claims 13 and 44).

Thus, it is seen that the general description of the prior art in Funkhouser et al. adds virtually nothing to the combined teachings of Baker and Murphy et al. in regard to the actual and explicit recitations of the

claims, considered as a whole, and does not address the *entirety* of the recitation for which it is applied against the claims.

Further, it is respectfully pointed out that Funkhouser et al. appears to have been cited only for the generalized description of the prior art of cladding since the actual invention disclosed therein (and, arguably, the prior art described) are directly contrary to the purpose and meritorious function of the invention. Specifically, Funkhouser et al. is directed to the application of an oxide dispersion strengthened (ODS) *coating* over the surface of a metal rather than developing a structure extending from such a surface. Further, it is clear from Funkhouser et al. at column 6, lines 6 - 16, for example, that the known cladding techniques are inadequate for such a purpose due to melting or overheating of the metal substrate, allowing migration and segregation of oxides and the formation of a non-uniform distribution of such materials in the cladded surface. Therefore, the *invention* of Funkhouser et al. is directed to (substantially) melting the powdered cladding material at a focal point of the laser beam *above* the surface to be clad such that he powder particle partially resolidify to a plastic state when they arrive at a defocused "hot zone" on the surface to be clad in order to derive the desired microstructure of the ODS material. See column 5, lines 4 - 23, and column 6, lines 39 - 52. Thus, the *invention* disclosed in Funkhouser et al. has nothing to do with the present invention defined by the claims.

Nevertheless, it appears that the Examiner may have confused the descriptions of the prior art and the actual invention of Funkhouser et al., particularly in regard to motivation for the combination with Baker and Murphy et

al. Specifically, the Examiner asserts that melting the powder in the melt pool (with coincident focal points of powder and laser beam impingement) as described as prior art in Funkhouser et al. would be obvious to obtain the advantage of a very fine microstructure and homogeneity of the clay layer while, as pointed out above, Funkhouser et al. explicitly indicates that a fine microstructure and homogeneity will *not* be obtained using the known technique (which, in any case, does not answer the claimed subject matter) and that the melting of the powder in the laser beam and with partial resolidification prior to deposition is required to obtain those effects.

In summary, the combination of Baker, Murphy et al. and Funkhouser et al. is respectfully submitted to be improper and deficient to answer the claimed subject matter considered as a whole. Baker is directed to forming a rotary cutting die by welding techniques and substantial machining while Murphy et al. does not teach or suggest the possibility of developing a cladding bead shape having a "near net shape" to the final shape desired for a cutting die blade or desirability of substituting cladding for welding, particularly to form a *functional* part. Neither Murphy et al. nor Funkhouser et al. answer the claimed melting or powder application and melting processes but, rather, both appear to indicate coincidence of the location of laser impingement and powder application that strongly suggests direct laser impingement to be the principal mechanism of melting of the cladding powder, contrary to the invention, as claimed. Funkhouser et al., including the prior art discussed therein, is directed to forming surface coatings rather than a blade shape extending from the surface to which cladding is applied and does not

mitigate the admitted deficiencies of Baker and Murphy et al. in regard to the actual recitations of the claims while the invention appears to remain distinguished from Murphy et al. in combination with a reference directed to forming welding beads as rotary cutting die beads (e.g. Baker) for essentially the same reasons resulting in its withdrawal as a reference against the claims in the action of August 17, 2001.

Most importantly, none of these references teach, suggest or lead to an expectation of success in developing a deposit of a blade material on a dissimilar material extending from the dissimilar material by cladding in the manner claimed and particularly not teaching, suggesting or leading to an expectation of success in obtaining a cladding bead of a near net shape for a cutting die blade. In this regard, the Examiner asserts on page 5 of the present action that a change in shape has been held to be obvious. However, the decision cited in support of that assertion is respectfully submitted to be inapposite to the issue presented here. The issue of alteration of a shape addressed in the decision cited is quite different from the development of a close approximation of a desired shape through a particular material deposition technique which, as pointed out above, is not taught, suggested or to be expected from the content of any of Baker, Murphy et al. and/or Funkhouser et al. taken singly or in any combination. Cox et al. has been cited for teaching use of heat treatment for hardening rotary cutting die blades but does not address any of the deficiencies of the basic combination of Baker, Murphy et al. and Funkhouser et al. and the Examiner has not asserted that it does.

Thus, none of the prior art taken singly or in any combination teaches or suggests the subject matter of any

claim, considered as a whole, and does not provide evidence of a level of ordinary skill in the art that would support a conclusion of obviousness of the differences of the claimed subject matter from the prior art as is required to make a *prima facie* demonstration of obviousness. Therefore, it is respectfully submitted that the grounds of rejection newly asserted by the Examiner are clearly in error and untenable and, upon reconsideration, should be withdrawn. Accordingly, such actions are respectfully requested.

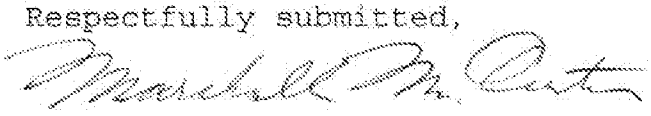
A sincere effort has been made to answer the issues newly raised by the Examiner in the present office action. All previous grounds of rejection have been overcome and the currently asserted grounds of rejection appear to be clearly in error as discussed in detail above. If, upon reconsideration, any issue is seen to remain or any ground of rejection to be maintained, it is respectfully requested that the Examiner contact the undersigned by telephone at the number given below in order to expeditiously resolve such issues.

Since all rejections, objections and requirements contained in the outstanding official action have been fully answered and shown to be in error and inapplicable to the claims, it is respectfully submitted that reconsideration is now in order under the provisions of 37 C.F.R. §1.111(b) and such reconsideration is respectfully requested. Upon reconsideration, it is also respectfully submitted that this application is in condition for allowance and such action is therefore respectfully requested.

A petition for a two-month extension of time has been made above. If any further extension of time is required for this response to be considered as being timely filed, a conditional petition is hereby made for

such extension of time. Please charge any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 50-2041.

Respectfully submitted,



Marshall M. Curtis
Reg. No. 33,138

Whitham, Curtis, Christofferson & Cook, P. C.
11491 Sunset Hills Road, Suite 340
Reston, Virginia 20190

(703) 787-9400
Customer Number: **30743**